ARMY ROBOTICS TECHNOLOGY
Evolution of Autonomy

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Report Documentation Page

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Motivations for High Levels of Autonomy in Military systems

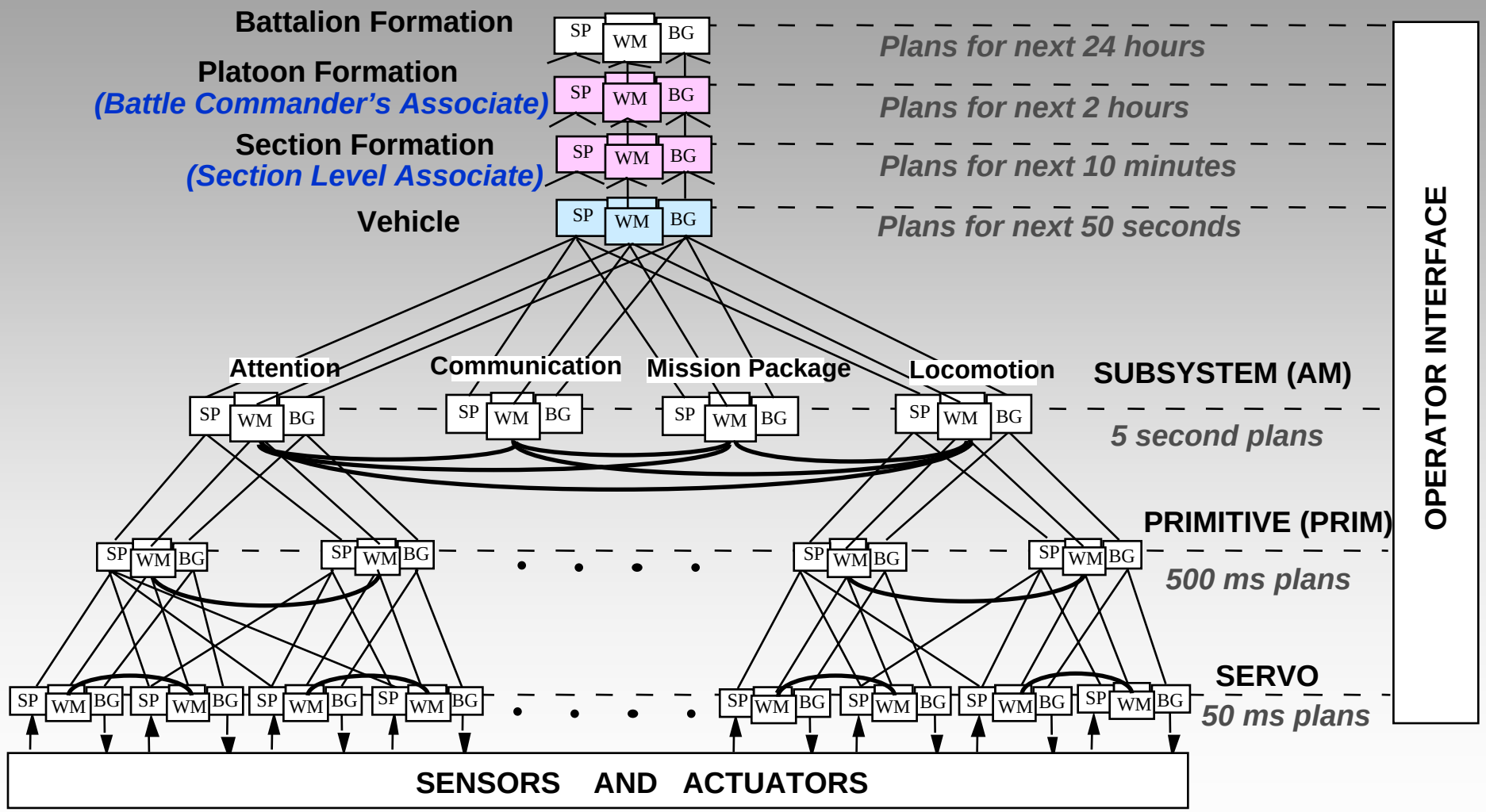
If realized correctly:

- **Increased survivability**
- **Increased span of control (one on many)**
- **Reduced communication data rate**
- **Reduced supervisory workload**
- **New operational flexibility (stay behind or die in place missions)**

Autonomy must be considered in the context of:

- **Mission scenario**
  - **Domain complexity**
  - **Problem structure**
    - **A priori knowledge of:**
      - **Terrain**
      - **Disposition of forces**
      - **Nav references**
    - **Type of mission**
    - **Mission complexity**
    - **Uniqueness**
    - **Consequences of success – failure**
    - **Countermeasures**
- **System capability**
- **Alternatives**

DEMO III
4-D/RCS REFERENCE ARCHITECTURE



Autonomous Mobility Technology Maturity Assessment

Preliminary Insights

Location	Complete runs	Total Runs	% Complete
FTIG	**156**	**181**	**86.2**
Tooele	**168**	**177**	**94.9**
U-FTIG	**264**	**288**	**91.7**
Total	**588**	**646**	**91.0**

XUV Autonomous Operation						
	Distance (km)			Time (hr)		
Location	Total	Autonomous	% Autonomous	Total	Autonomous	% Autonomous
FTIG	203.4	188.1	92.5	39.6	33.1	**83.5**
Tooele	203.8	199.3	97.8	34.3	31.9	**92.9**
U-FTIG	152.7	149.1	97.6	25.6	22.8	**89.1**
Total	**559.9**	**536.5**	**95.8**	**99.5**	**87.7**	**88.2**

Operator Interventions Required During Autonomous Operation					
Course	Freq	Mean distance between interventions (km)	Mean time between Interventions (Minutes)	Mean intervention duration (Minutes)	Mean intervention distance (m)
FTIG	173	1.2	13.7	2.3	88.4
Tooele	48	4.2	42.9	3.0	93.2
U-FTIG	106	1.4	14.5	1.6	34.2
Total	**327**	**1.7**	**18.3**	**2.2.**	**71.5**

U.S. Army RDE Command

Robotics Technology Roadmap
Presentation to
RDECOM Board of Directors

Charles Shoemaker
Robotics IPT Technology Manager

RDE Command Robotics IPT
Mission/Task

Develop an innovative, affordable, and integrated portfolio of robotics technology (air, ground, unattended sensors, …) programs and demonstrations that will:

- **Assess and guide the execution, integration, and transition of robotics programs and transition of robotics related and feeder technology programs.**
- **Support development of robotic ground systems, air systems, control systems for Current, Stryker and Future Forces.**
- **Leverage national and international technical expertise.**
- **Develop gap-filler programs.**

MEMBERS: AMRDEC, ARDEC, ARL/ARO, CERDEC, TARDEC, NSC, PEO-STRI, ATEC, DOE, NGIC/MSIC, TRADOC, RDECOM/SOSI

Robotics & Transformation

Unmanned Systems Seamlessly Integrated into the Future Force

Manned Unmanned Teaming

UAV Class IV

UA (X)

UAV Class III

UA (II)

UAV Class II

UA (I)

UAV Class I

UA (I)

MULEs

SUGVs

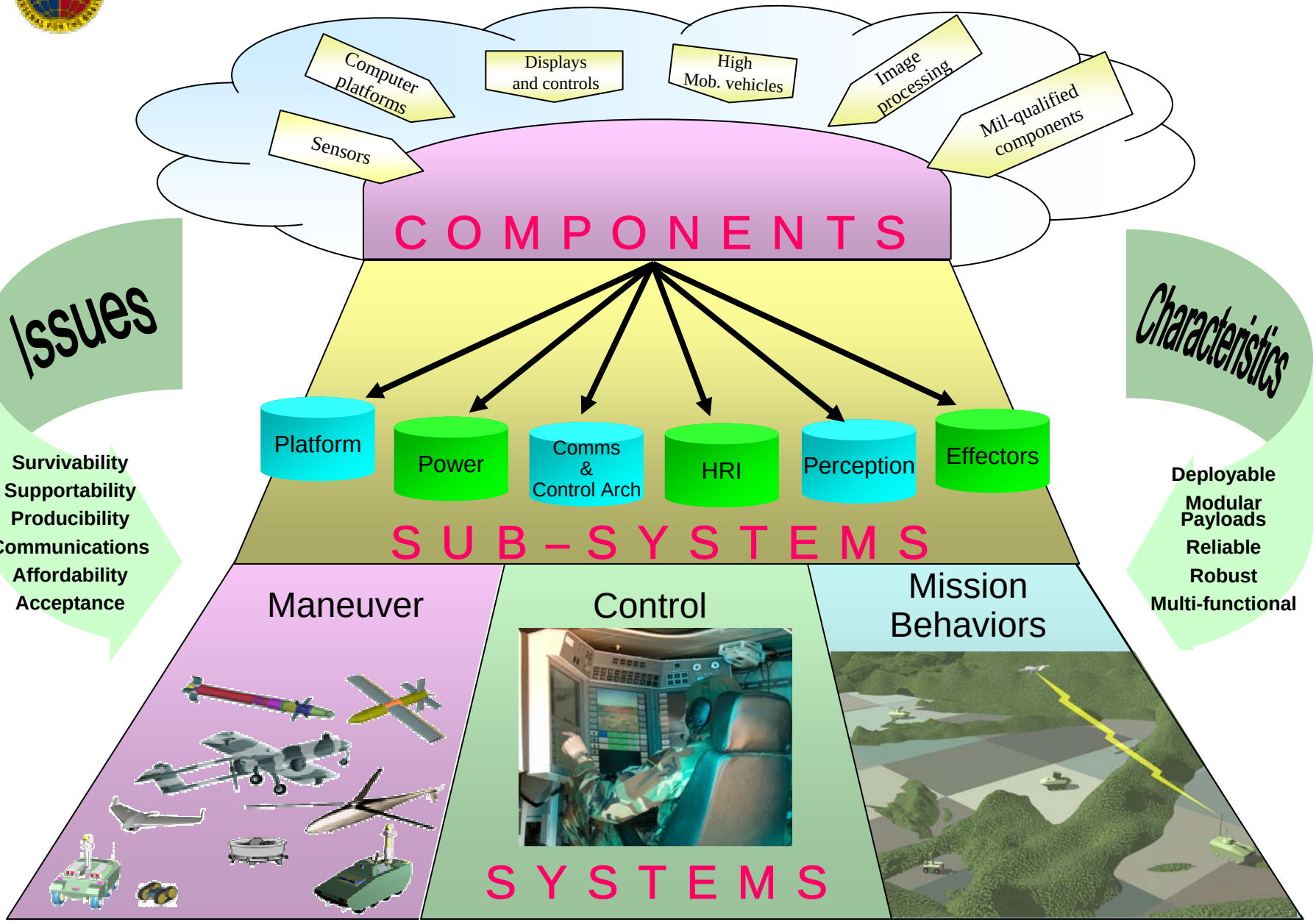
ARVs

FCS Increment I UA Unmanned Systems*
(for one UA)

UAV Class I	54
UAV Class III	14/56
SUGV	81
MULE	54
ARV-A(L)	27
UGS	157

*Source AMSAA Systems Book, 3.0

Robotics Systems of Systems Integration



Robotics IPT

Accomplishments/Way Ahead

Accomplishments (FY03)

- Stood-up IPT
  - Improved coordination/cooperation among IPT organizations
    - Relevant STOs & ATDs identified
    - Integrated TRADOC roadmap efforts into ONE Robotics Roadmap
- Briefed draft Roadmap to RDECOM BOD, WTC, and CG AMC
- Met with LSI/LTI to develop strategy for synchronizing objectives/deliverables with OF
- SOSI International tapped to serve as agent to integrate international activities
- Briefed JFCOM futures cell (Alpha Team)
- ARL Robotics Project Office added task order to Robotics CTA addressing OFW robotics functionality

Way Ahead (FY04)

- Develop Robotics Roadmap Investment Strategy
- Identify maximum leverage transition opportunities key to OFW
- Formalize transition plans, identify deliverables, integrate in Robotics Roadmap
- Examine existing programs with regard to their impact upon Future Force
- Examine key systems issues, e.g., architectures, interfaces, scalability, & integration
- Examine resources available
- Evaluate new and existing STO's and ATD's in light of above factors
- Develop Roadmap implementation strategy for review and action by BOD